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# U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1314

## MOTOR TRUCKS ON CORN BELT FARMS



**T**HIS BULLETIN is based on the experience of more than 500 grain and live-stock farmers located in the Corn Belt, each of whom has owned and used a motor truck over two years. It is designed to be of assistance to other farmers in the same region in determining whether or not they can use trucks profitably, and to assist men who already own trucks in determining whether or not they are using their machines as efficiently as others.

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# MOTOR TRUCKS ON CORN-BELT FARMS.

H. R. TOLLEY, *Agricultural Engineer*, and L. M. CHURCH, *Assistant in Agricultural Engineering, Division of Agricultural Engineering, Bureau of Public Roads.*

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## FARMS ON WHICH TRUCKS ARE OWNED.

REPORTS were sent to the Department of Agriculture in February and March of 1920, by over 1,000 farmer truck owners in Illinois, Indiana, Iowa, eastern Kansas, southern Minnesota, Missouri, eastern Nebraska, southeastern South Dakota, and southern Wisconsin. Each of these truck owners reported the size and type of his farm, the size of his motor truck, the length of time he had owned it, the use which he was making of it, the cost of operating it, and other related information. A complete analysis of the report from 831 grain and live-stock farmers is given in Department Bulletin 931, "Corn-Belt Farmers' Experience with Motor Trucks."

These reports covered the year of 1919, and at that time the prices of farm products were relatively high, farm labor was scarce and high in price, and in general conditions were favorable to the use of trucks by farmers. In order to determine whether farmers were continuing to use trucks during the period when prices were low and labor less valuable, each of these men who had given a report on his machine in 1920 was asked in February, 1922, for a statement as to whether he was still using his motor truck, and, if so, to give his idea of its profitableness under the conditions which prevailed at that time, to furnish information from which the cost of operating the machines under 1922 conditions could be computed, and for other related information which would be of assistance to farmers who do not own trucks in determining whether they can use them profitably at the present time, and, if so, the size and type which would probably be best suited to their conditions.

A total of 555 men replied to the request for information. The number in each State and the size of the farms which they were operating at the beginning of 1922 are given in Table 1. Each of these men is practicing the general grain and livestock farming

characteristic of the Corn Belt. On every farm corn is one of the principal crops, and in most cases the raising and feeding of hogs is an important enterprise. Reports from farms where dairying is the principal enterprise are not included.

TABLE 1.—*The number of reports from different States, average size of farm, and average number of crop-acres per farm.*

State.	Number of reports.	Size of farm.	Crop-acres.	State.	Number of reports.	Size of farm.	Crop-acres.
		<i>Acres.</i>				<i>Acres.</i>	
Illinois.....	101	266	205	Eastern Nebraska.....	79	343	236
Indiana.....	34	279	213	Southeastern South Dakota.	99	431	298
Iowa.....	142	284	232	Southern Wisconsin.....	11	242	173
Eastern Kansas.....	25	530	313				
Southern Minnesota.....	25	279	208	Total.....	555		
Missouri.....	39	433	286	Average.....		334	242

Of the 555 men, 508, or 92 per cent, still owned the motor trucks on which they reported in 1920, and had used them in 1921.

Of the 47 men who no longer owned the trucks on which they originally reported, 21 had replaced them with others, and the remaining 26 had not purchased others.

#### SIZE OF FARM.

The average size of the farms on which these motor trucks are owned is considerably greater in each State than the average size of all farms. The 1920 census of agriculture shows that the average size of all farms in the States of Illinois, Indiana, Iowa, and Missouri is 135, 103, 157, and 132 acres, respectively.

In general, there will be more work for a truck on a large farm than on a small one, and a prospective purchaser should remember that if his farm is small the amount of hauling he will have for the motor truck will probably be less than that done by the men reporting.

#### DISTANCE TO MARKET.

Another striking point concerning the farms on which trucks are owned is their great distance from market as compared with other farms in the same section. A total of 475 men reported the distance from their farms to the markets which they used before purchasing trucks, and the average of these reports was 8 miles.

The proportion of the 475 farms at different distances from the markets used before trucks were purchased is as follows:

	Per cent.
Less than 5 miles.....	19
From 5 to 9 miles.....	50
From 10 to 14 miles.....	23
15 miles and over.....	8

A considerable number of these men have changed their markets since purchasing trucks, and are now using markets still further from their farms (see p. 7).

Farm survey records of other farms in different areas of the Corn Belt indicate that a majority of all Corn-Belt farms are less than 5

miles from market. The average distance from market of 2,213 Corn-Belt farms, as shown by records in the Office of Farm Management and Farm Economics of the Bureau of Agricultural Economics, is 3.9 miles, and the number at different distances is as follows:

	Number.	Per cent.
Less than 5 miles from market.....	1,535	69.3
From 5 to 9 miles from market.....	612	29.1
10 miles and over from market.....	36	1.6

These 2,213 farms can not be considered as exactly representative of all Corn-Belt farms, but a comparison of their distances from market with the distances from market of the farms on which



FIG. 1.--The motor truck is most advantageous to the man who is far from market or shipping point.

trucks are owned shows clearly that most of the men whose reports form the basis for this bulletin have exceptionally long hauls.

The time required for hauling to and from the farm generally is greatest for those farmers farthest from market, and it is on such farms that most use will be found for motor trucks. (See Fig. 1.) One who is only 2 or 3 miles from market must have an exceptionally large amount of hauling if one expects sufficient work for a truck to make it a profitable investment.

### SIZE OF TRUCK.

The number of trucks of different sizes on the 508 farms where the original trucks were still in use, the average size of the farms, and the average distances to the markets which were used before the

purchase of trucks are given in Table 2. There is little difference in the size, and distance to market, of the farms on which the trucks of different sizes are owned, and evidently neither the size of the farm nor the distance to market had very much to do with the sizes of the trucks which the men purchased.

TABLE 2.—*Number of trucks of different sizes, size of farms on which they are used, and distance to market before trucks were purchased.*

Size of truck.	Total number.	Average size of farm.	Average crop-acres.	Average miles to market.
		<i>Total acres.</i>		
$\frac{1}{2}$ -ton.....	64	332	244	6.5
1-ton.....	348	323	235	8.1
1 $\frac{1}{2}$ -ton.....	57	363	266	8.1
2-ton.....	39	396	274	8.9
Total.....	508			
Average.....		334	242	8.0

### ARE THESE TRUCKS PROFITABLE?

The method of conducting the investigation was such that it was not possible to determine the extent to which the use of motor trucks had changed the incomes of these men, but each one was asked the question "Do you believe this truck has been a profitable investment?" Each of the owners undoubtedly expected when he purchased his truck that it would prove a profitable investment, and the replies to this question should at least show the extent to which the trucks have not come up to the expectations of their owners. In all, 81 per cent of the men reporting in 1922 stated that they believed their trucks would prove profitable. A summary of the replies of the same men in 1920, two years earlier, showed that at that time 91 per cent believed their trucks would prove profitable.

That some of these men had changed their opinions during the two years between the reports was probably due both to the fact that as the trucks became older the cost of operating some of them had increased unduly, and furthermore that economic conditions in 1922 were not as favorable to the use of motor trucks as they were in 1920 and earlier.

The size of the trucks evidently had something to do with their owners' opinions as to their profitableness. In 1922, 84 per cent of the owners of the 1-ton and smaller sizes, and only 68 per cent of the owners of trucks of larger sizes believed their machines would prove profitable. In 1920, 92 per cent of the owners of the 1-ton and smaller sizes and 84 per cent of the owners of the larger sizes believed their trucks would prove profitable.

Practically all of these men, however, expected to continue to use their machines even though they did not believe they were proving profitable, 98 per cent of the 508 men who still owned their original trucks having stated that they expected to use them during 1922. In reply to the question as to whether they intended to buy others when their present machines are worn out, 85 per cent gave affirmative answers.

**ADVANTAGES AND DISADVANTAGES.**

There are many advantages in the ownership of a motor truck, but just how great these advantages are, and which should be given the greatest weight, are questions which the man who has not had experience with a truck can not answer. The important things for the prospective purchaser of a motor truck to know are what the men who have used trucks have found to be their principal advantages and disadvantages in actual practice. These motor-truck owners were asked the questions, "What is the principal advantage of a motor truck for farm use?" and "What is the principal disadvantage?"

In 1922, 93 per cent of the owners reported that the saving of time was the principal advantage, and in 1920, 90 per cent of the same owners gave the same reply. There are other advantages, of course, but evidently this is the principal one in the minds of truck owners. Very few report that the principal advantage of the truck is that it enables them to go to a better market, but 33 per cent of the total number now use other markets than before the purchase of their trucks. Going to a market which is farther from the farm is simply a matter of taking more time for marketing, and a considerable number of the men who say that saving of time is the principal advantage find that the truck saves them sufficient time to enable them to go to the better market. Reducing shrinkage when marketing live stock, which is often mentioned as one of the big advantages of a motor truck, is also largely a matter of reducing the time required for getting the stock from farm to market.

That such a small number consider other factors, such as the saving of horses, the reducing of expense, and added convenience, as the principal advantages of the truck, indicates that the amount of time which the motor truck will save, which may incidentally result in reaching a better market or getting live stock and crops to market in better condition, is the item which should be given paramount importance when considering the purchase of a motor truck.

As to the greatest disadvantage, in 1922, 58 per cent reported "poor roads"; 18 per cent "cost of operation"; and 9 per cent "first cost of the truck." Very few reported any other single item as the greatest disadvantage. In 1920, 54 per cent of these same men reported "poor roads"; 8 per cent "cost of operation"; and 8 per cent "first cost of the truck."

Most Corn-Belt truck owners are so situated that at least a part of the roads which they must use are unimproved and such roads are likely to be impassable for trucks at certain times of the year. (See p. 9.)

The cost of operation evidently was considered a more important disadvantage by truck owners in 1922 than in 1920. This doubtless was partly due to the fact that in 1922 the costs of repairs and of fuel and oil were higher with respect to the prices of farm products than they were at the date of the earlier report.

**THE BEST SIZE.**

That a man considers his motor truck a profitable investment does not mean, however, that he is entirely satisfied with the particular



machine which he owns. It is very important that the truck should be of the proper size for the hauling which it is to do. Ordinarily both the first cost and the cost of operation of a small truck will be less than the costs of a large one, but often the small truck will not carry loads as large as desired, and more trips to haul a given amount of material will therefore be necessary than with a larger truck. A truck which is too large, however, would have to be operated with only a partial load a great part of the time, and the extra cost may more than offset the advantage of being able to carry larger loads on exceptional occasions. Accordingly each farmer was asked to state what size he considered best for his conditions, regardless of the size he owned.

It was found that in 1922, 66 per cent of these truck owners preferred the 1-ton size, 21 per cent the 1½-ton size, 9 per cent the 2-ton

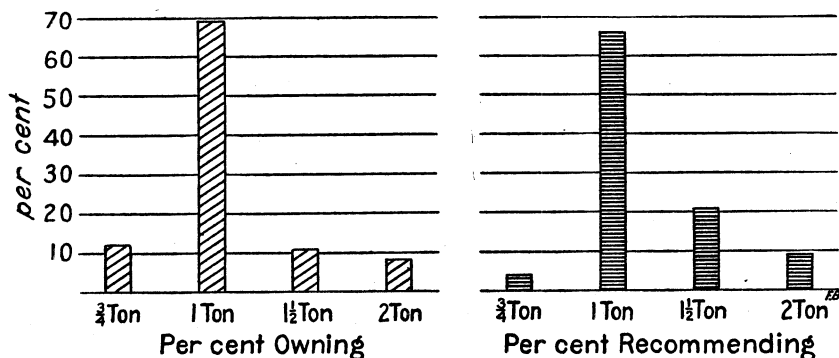


FIG. 2.—Sizes of motor trucks owned, and sizes recommended.

size, and 4 per cent the ¾-ton size. In 1920 the replies by these same men to the same question were as follows:

	Per cent.
1-ton size recommended by.....	57
1½-ton size recommended by.....	24
2-ton size recommended by.....	13
¾-ton size recommended by.....	6

Evidently the two years of additional experience has convinced a larger number of these men that a 1-ton truck is best for their conditions.

The proportion of those reporting who now own the different sizes of trucks, and the proportion who in 1922 preferred trucks of certain sizes, are shown in Figure 2. It is apparent that the choice of a truck for a Corn-Belt farm similar in size, type, and distance from market to farms operated by the men reporting, should in a large majority of cases lie between the 1-ton and the 1½-ton sizes.

### CHANGE OF MARKETS.

Many farmers who do not own trucks are using first-class markets, and there are many whose farms are so located that even motor trucks will not put such markets within reach. However, about 33 per cent of the truck owners reporting in 1922 have changed since purchasing trucks to markets farther from the farms, and the primary reason for the change was that the new market is better than the old one.

The men who have changed markets are on an average 7 miles from the markets they used before purchasing trucks, and 16 miles from the markets which they now use. Before purchasing trucks 73 per cent of them were using markets less than 10 miles distant, but now 64 per cent are using markets 10 miles or more from their farms. About one-fourth go to markets which are 20 miles or more away.

The fact that a man has changed his market since the purchase of his truck does not necessarily mean that he hauls all of his produce to the new market, or that he hauls all of his supplies for his farm from that place. A considerable number of the men who reported a change of market still do some hauling to and from the market which they used before trucks were purchased.

A few of the men who in 1920 reported that they had changed markets stated in 1922 that they were no longer using the new market, but were marketing all of their produce at the place which they

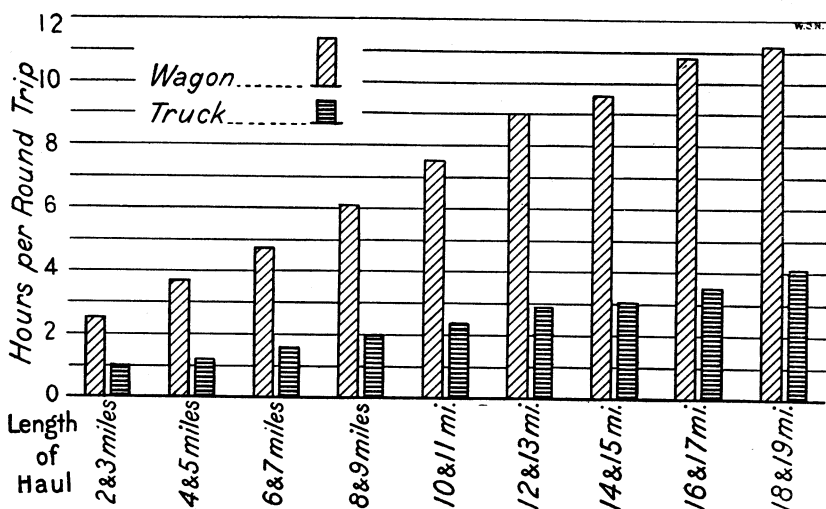


FIG. 3.—Comparison of time required for hauling different distances with wagons and with trucks.

used before purchasing trucks. Such men had found that under the conditions existing at the time of their later reports the advantage of the new market was not sufficient to pay for the extra time and expense required to reach it, even with the motor truck.

### ROAD HAULING WITH TRUCKS.

Figure 3 shows the time required for the round trip when hauling different distances with wagons and with trucks as reported by about 500 Corn-Belt truck owners in 1920. The truck owners were not asked to give this information in their later reports. The time shown includes the time required for loading and unloading the wagon or truck. For each distance the time required with trucks is something like one-third that required with horses and wagons. (See Fig. 4.)

This chart will give the prospective purchaser a definite idea of the amount of time the truck will save him provided he expects to

haul with the truck loads of the same size as he has hauled with his horses and wagon. As a matter of fact, the owners of the  $1\frac{1}{2}$ -ton and 2-ton trucks reported that on the average they hauled considerably larger loads of crops and live stock with their trucks than with horses and wagons, while the owners of the 1-ton and  $\frac{3}{4}$ -ton trucks hauled loads of approximately the same size as with wagons.

#### RETURN LOADS.

The percentage of time which a truck is run without load has a direct bearing upon the cost per unit of hauling with it. If an owner can arrange to haul a load to market and then bring back a load of supplies to his farm on the same trip he can reduce the time required and expense by practically 50 per cent. The 1920 reports,



FIG. 4.—Unloading hogs at stockyards from farm-owned truck. Motor trucks enable many farmers to haul live stock direct to central markets which are too far away to be reached with horses and wagon.

as summarized in United States Department of Agriculture Bulletin 931, showed that the truck owners reporting at that time had return loads for their trucks about 34 per cent of the time. About 10 per cent stated that they never had return loads. Apparently the size of the truck and distance from the farm to market had little to do with the percentage of the time return loads were available.

#### ROAD HAULING FOR WHICH TRUCKS ARE NOT USED.

A little over half the men reporting in 1922 stated that they used their horses to supplement their trucks in hauling on the road during the preceding year. These men who had used horses had done on the average about 17 per cent of their total road hauling with them, and the remaining 83 per cent with their trucks. On this basis for all farms reporting 8 per cent of the road hauling had been done with horses and 92 per cent with trucks.

Most of these men use horses only for road hauling which must be done when the roads are in such a condition that trucks can not be used, or for hauling material which the body of the truck is unsuited to carry. In 1920 the men who used horses were asked to state the reason for so doing. Seventy-one per cent of those replying at that time gave "poor roads" as the reason, and 14 per cent gave as the reason that the truck body was unsuitable for the material to be hauled.

### **EFFECT OF DIFFERENT KINDS OF ROADS ON USE OF TRUCKS.**

Poor roads, in the minds of most men who own trucks, are the greatest disadvantage connected with their use, and poor roads are largely responsible for the continued use of horses for part of the road hauling. In the 1920 investigation each truck owner was asked to specify the kind of roads over which his truck traveled and the number of weeks during the preceding year the roads had been in such condition on account of mud, snow, ice, or frost that the truck could not be used. The replies should give the prospective purchaser a definite idea of the difficulties he is likely to experience in this respect.

All kinds of roads, from unimproved dirt roads to high-class highways, were reported. However, 80 per cent of the men who reported on this point stated that their trucks ordinarily travel only on dirt roads, 14 per cent stated that the roads which they ordinarily use are part dirt and part improved, and the remainder stated that they have only improved roads, either gravel, macadam, or better.

On the average there were 8.4 weeks during the year when the trucks could not be used, and only about 6 per cent of the men reported that they were able to use their trucks every week. The men whose trucks usually travel on improved roads only, however, were prevented from using them but five weeks during the year, and over one-fourth were able to use them every week.

The reports indicate that poor roads are not such a great handicap to pneumatic-tired trucks as to those equipped with solid tires. About 10 per cent of the men who have pneumatic-tired trucks were able to use them every week in the year, and less than 30 per cent were laid up for more than 8 weeks by poor roads. Less than 2 per cent of the men whose trucks were equipped with solid tires were able to use them every week, and over 45 per cent of them were laid up for more than 8 weeks.

### **HAULING ON THE FARM WITH TRUCKS.**

Most of the work which these farm-owned trucks do is hauling on the road, but often a truck can be used to advantage for some of the hauling on the farm itself—that is, in the fields and around the buildings. About 70 per cent of the men reporting in 1922 stated that they used their trucks for some of this hauling, while the remaining 30 per cent stated that they did it all with horses.

Most of the time required for hauling on the farm is taken up with loading and unloading, and the percentage of the total time which could be saved by the truck when used for such work is small as compared with the time it saves in road hauling. The smaller trucks

sometimes will not carry loads as large as it is desired to haul, and sometimes the bodies with which they are equipped are not suitable for the material to be hauled about the farm. In many cases the truck can not obtain traction in the field. When horses which would otherwise be idle are available it would naturally be more profitable to use them if there is no advantage or convenience in using the truck.

However, when the vehicle must be left without attention for a considerable length of time, or if frequent stops are to be made, it may be preferable to use the truck, and the truck may save considerable time in hauling about the farm if the farm is large and satisfactory roadways are available. (See Fig. 5.) It may also save time to use the truck when only one or two loads are to be hauled, and wagons and horses are not ready for work.



FIG. 5.—Unloading grain from a truck. The motor truck can often be used advantageously for hauling grain from the separator to the granary.

### CUSTOM HAULING.

While all of the men whose reports form the basis of this bulletin used their trucks primarily for their own hauling, about 37 per cent did some hauling for hire during the year preceding the time of reporting. The men who did custom hauling were also asked what percentage of the total time the trucks were used during the year was spent in custom hauling, and it was found that for those who did such work custom hauling amounted to about 15 per cent of the total time the trucks were used. Nearly all truck owners doubtless have opportunities to do custom hauling with their machines if they desire to do so, but a farmer can not often afford to neglect the work on his own farm to do work for neighbors. However, if his whole time is not fully occupied, a truck owner can easily increase his income by hauling for hire. Many of these truck owners stated that

the principal reason for doing custom hauling was to accommodate their neighbors, and often in such cases the charge for it was too low to make the work profitable.

### ANNUAL USE OF TRUCKS.

The number of miles per year which a truck travels has a direct bearing upon the cost per mile run and per ton hauled, and the prospective purchaser should give careful consideration to the amount of use which he will have for his truck. The amount of material to be hauled, the size of the truck, and the length of haul will all have an influence on the distance per year which a truck will travel. Depreciation, interest, and repairs are all more or less independent of the number of miles which the truck travels per year, and the greater the number of miles traveled or the greater the amount of material hauled the less will be the charge per mile run or per ton hauled for these items.

The distances which their owners estimated these trucks traveled in 1921 are shown in Figure 6. The average distance traveled per year, according to these estimates, is 1,987 miles.

These men also estimated the number of days per year on which they use their trucks—not the number of full days' work which the truck does, but simply the number of days on which some use is made of it—and the average of these estimates was 72 days for 1921. Thus the trucks traveled on the average about 28 miles each day on which they were used. On the average  $\frac{3}{4}$ -ton trucks were used 88 days and traveled 2,765 miles during the year; 1-ton trucks were used 72 days and traveled 1,820 miles during the year;  $1\frac{1}{2}$ -ton trucks were used 59 days and traveled 2,111 miles during the year; 2-ton trucks were used 68 days and traveled 2,035 miles during the year.

As shown in Figure 6, about 14 per cent of the trucks traveled 750 miles or less during the year. This is a very low utilization for a machine so expensive and capable of doing so much more work. The cost per mile run and per ton hauled with the truck would necessarily be very high on these farms, and it is doubtful if a truck which travels no more than 750 miles a year can often save its owner enough time to make it a profitable investment.

### COST OF OPERATION.

#### FIRST COST.

The average first cost of the trucks of different sizes, including extra equipment purchased for use with them, was: For  $\frac{3}{4}$ -ton trucks, \$1,486; for 1-ton trucks, \$987; for  $1\frac{1}{2}$ -ton trucks, \$1,943; for 2-ton trucks, \$2,115.

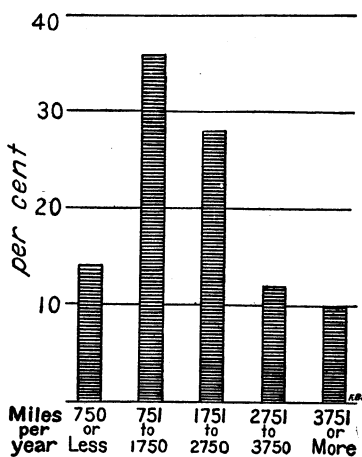


FIG. 6.—Percentage of motor trucks which travel different distances per year.

Often the quoted price of a truck does not include some equipment which it is necessary or desirable to have, and about two-thirds of the men reporting had purchased some such equipment. This varied from minor attachments, costing only \$2 or \$3, to cabs and bodies costing several hundred dollars. It must also be remembered that practically all of these trucks were purchased in 1917, 1918, or 1919, and that the price of motor trucks in general was at that time higher than the prices which now (June, 1922) prevail.

#### LIFE.

The average life of these trucks, as estimated in 1922 by their owners, is 8.4 years. The estimated life of the  $\frac{3}{4}$ -ton trucks is 7.9 years, 1-ton trucks 8.3 years,  $1\frac{1}{2}$ -ton trucks 9 years, and 2-ton trucks 8.3 years.

The estimate of the life of a truck depends not only upon the probable amount of work which it will do and the care which it will be given, but also upon the owner's idea as to when it will be cheaper to discard it and purchase a new one than to spend more time and money on it for repairs. There is quite a wide variation in the individual estimates on this item, but the averages will give the prospective purchaser a fairly definite idea of the amount of service he may expect from a truck.

#### DEPRECIATION.

The average first cost of the trucks of different sizes divided by the average life gives an annual depreciation of \$188 for the  $\frac{3}{4}$ -ton trucks, \$119 for the 1-ton trucks, \$216 for the  $1\frac{1}{2}$ -ton trucks, and \$255 for the 2-ton trucks. The annual depreciation divided by the average number of miles traveled per year gives a depreciation charge per mile of travel of 6.8 cents for the  $\frac{3}{4}$ -ton trucks, 6.5 cents for the 1-ton trucks, 10.2 cents for the  $1\frac{1}{2}$ -ton trucks, and 12.5 cents for the 2-ton trucks.

The depreciation per year and per mile varies greatly for individual trucks, but these average figures at least show the importance of this item. For each size the depreciation charge as here given is greater than the combined costs of fuel, oil, and tires (see p. 15).

#### REPAIRS.

The repair costs vary greatly with individual trucks, but the prospective owner will desire to know something as to what he must expect. Repairs will ordinarily be low for the first year or two of the truck's life. Of the men who furnished reports in both 1920 and 1922, 472 gave on their first reports the amount which they had spent up to that time for repairs, and 431 gave on their second report in 1922 the amount which they had spent up to that time for repairs.

Of the 472 reporting in 1920, 100 had owned their trucks 6 months or less, and 68 of the 100 had spent nothing for repairs, while the average cost of repairs for the 32 had been about \$13; 166 had owned their machines from 7 to 12 months, and 92 had no repairs, while the average cost for the 74 had been about \$13; 184 had owned their machines 13 to 24 months, and 40 had no expense for repairs, while the average cost for the 144 had been about \$29; 22 had owned their

machines 25 months or more, and as all had spent something for repairs the average cost was about \$33.

At the time the 1922 reports were made, all of the machines had been in use more than two years. Of the 431 who reported their repair costs at that time, 246 had owned their machines 25 to 36 months, and the average repair cost from the time of purchase had been \$47; 160 men had owned their trucks 37 to 48 months, and the average repair cost from the time of purchase had been \$80; 25 men had owned their trucks more than 48 months, and the average repair cost had been \$82.

There were wide variations in the repair costs of individual trucks of the same size and age, but in general it is to be expected that the repair costs will be higher for the larger trucks, and that they will increase as the trucks become older.

On the average, the trucks which had been in use between 3 and 4 years, with an average total repair cost of \$80, had an average annual repair cost of approximately \$25, but it is evident that the average annual repair cost for the entire life of these trucks would be higher. In the absence of more accurate figures, allowances of \$75 per year for the  $\frac{3}{4}$ -ton trucks, \$75 for the 1-ton trucks, \$100 for the  $1\frac{1}{2}$ -ton trucks, and \$150 for the 2-ton trucks have been made as fair charges for the average annual repair costs in figuring the cost of operation. (See p. 15.)

#### GASOLINE AND OIL.

The average number of miles per gallon of gasoline obtained by men who own trucks of different sizes is about 11.2 miles for the  $\frac{3}{4}$ -ton, 10.5 miles for the 1-ton, 9.1 miles for the  $1\frac{1}{2}$ -ton, and 7.9 miles for the 2-ton trucks. There is practically no difference between the 1920 and the 1922 reports as to the average number of miles per gallon of fuel for the different sizes. The average number of miles per quart of lubricating oil for the machines of different sizes as reported in 1920 was 80 miles for the  $\frac{3}{4}$ -ton, 46 miles for the 1-ton, 52 miles for the  $1\frac{1}{2}$ -ton, and 38 miles for the 2-ton trucks. Since lubricating oil is one of the minor items of expense, the owners were not asked to report concerning it in 1922.

The price of gasoline to farmers in the Corn Belt is at present (June, 1922) about 22 cents per gallon. The average price of lubricating oil of the quality used by these men is something like 65 cents per gallon. On this basis the total cost per mile for gasoline and lubricating oil for the trucks of different sizes would be 2.2 cents for the  $\frac{3}{4}$ -ton, 2.5 cents for the 1-ton, 2.7 cents for the  $1\frac{1}{2}$ -ton, and 3.2 cents for the 2-ton trucks.

#### TIRES.

Tire costs vary, of course, for trucks of different sizes, depending upon whether solids or pneumatics are used and to a certain extent upon the quality of the tires and upon the number of miles traveled per year. In the 1920 investigation each truck owner estimated the number of miles which his tires run and gave the price which he paid for them. According to the estimates of 310 men given at that time, pneumatic tires run on an average 4,400 miles, and the esti-



mates of 161 men showed that solid tires run 7,700 miles. At that time 24 per cent of the trucks on which reports were received were equipped with pneumatic tires, 27 per cent with solid tires, and 49 per cent with pneumatics in front and solids in rear.

A comparison of the present (June, 1922) prices of truck tires with the 1919 prices shows that in 1922 the first cost of pneumatic tires similar to the ones with which these trucks are equipped is about 70 per cent of the 1919 costs, while solid tires are about 80 per cent of the 1919 costs. The cost per mile of pneumatic tires for all sizes of trucks, as given in Table 3, was obtained by taking 70 per cent of the 1919 costs.

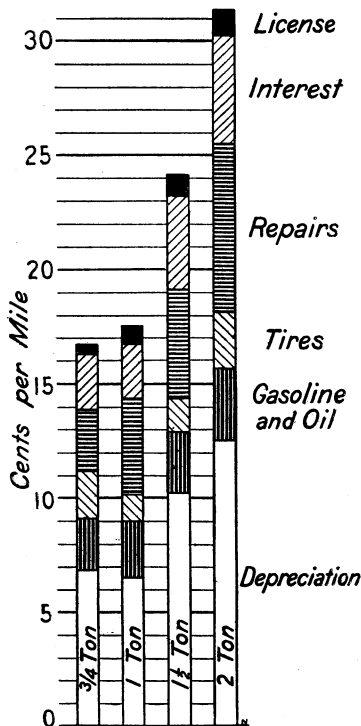


FIG. 7.—Cost per mile of operating trucks of different sizes.

#### AVERAGE COST PER MILE.

The average cost of operating trucks of different sizes is shown in Figure 7 and Table 3. The items included are depreciation, repairs, interest on investment, registration and license fees, gasoline and oil, and tire cost.

The figures for annual depreciation are obtained from page 12 and those for repairs from page 13.

Interest is figured at 8 per cent on the average investment. The average investment has been found by the rule: Average investment equals the first cost multiplied by years of service plus 1, and this result divided by years of service multiplied by 2. This is the generally accepted method for determining the average investment in equipment where a fraction of the first cost is charged off each year for depreciation. The interest charge, when computed on this basis, is slightly greater than when computed on half the first cost.

The registration and license fees are the averages for the year 1922 in the States covered by the investigation.

There is considerable variation in these fees for trucks of the same size in different States. They range from \$6 for the small trucks in Missouri and Indiana to \$35 for the 2-ton trucks in South Dakota.

The number of miles traveled per year, the gasoline and oil costs, and the tire costs are all discussed above. The tire costs used are those for pneumatic tires for each size. In no case is the average cost for solid tires more than 1 cent per mile different from the pneumatic-tire costs.

No charge has been made for taxes, insurance, housing, grease, inner tubes for pneumatic tires, or for labor spent in caring for the truck. However, these charges would ordinarily amount to a very small portion of the total cost of operation.

TABLE 3.—*Cost of operating trucks of different sizes.*

	Size of truck.			
	$\frac{3}{4}$ -ton.	1-ton.	1 $\frac{1}{2}$ -ton.	2-ton.
Fixed charges:				
Annual depreciation.....	\$188	\$119	\$216	\$255
Annual repairs.....	75	75	100	150
Annual interest.....	67	44	86	95
Annual registration and license fees.....	12	14	19	25
Total fixed charges.....	342	252	421	525
Miles traveled per year.....	2, 765	1, 820	2, 111	2, 035
Fixed charges per mile.....	\$0. 124	\$0. 138	\$0. 199	\$0. 258
Gasoline and oil per mile.....	.022	.025	.027	.032
Tires per mile.....	.021	.012	.015	.024
Total cost per mile.....	.167	.175	.241	.314

## COST OF HAULING WITH TRUCKS.

The cost of hauling with a motor truck is determined by the cost of operating the truck, the charge for the driver's time and labor, the size of load hauled, and the percentage of time the truck runs without a load. In Table 4 are given the cost per mile of haul and the cost per ton-mile for hauling crops with trucks of different sizes. The cost of operating the truck is taken directly from Table 3. The charge for the driver is obtained by allowing a rate of 25 cents per hour for his time while driving and while loading and unloading the truck. The average time required for hauling, as given by the truck owners in 1920, was 0.12 hour per mile of travel for each size of truck.

TABLE 4.—*Cost of hauling crops with trucks of different sizes.*

	Size of truck.			
	$\frac{3}{4}$ -ton.	1-ton.	1 $\frac{1}{2}$ -ton.	2-ton.
Truck cost per mile run.....	\$0.167	\$0.175	\$0.241	\$0.314
Charge for driver per mile run.....	.030	.030	.030	.030
Total.....	.197	.205	.271	.344
Cost per mile of haul (33 per cent idle running).....	.294	.306	.404	.514
Cost per ton-mile for hauling crops.....	.221	.234	.232	.234

It is stated on page 8 that these men have return loads for their trucks about 34 per cent of the time; that is, each truck hauls loads both ways on 34 out of every 100 round trips it makes from and to the farm, and runs without a load 66 one-way trips. The cost of operating the truck and the value of the driver's time for these 66 trips with no load must be charged to the 134 trips with loads, in order to obtain the actual cost per mile of haul. Every 134 miles of haul, then, must bear the expense of 200 miles of travel, or every 67 miles of haul must bear the expense of 100 miles of travel. The cost per mile of haul as given in Table 4 is obtained by multiplying the total cost per mile traveled by 100 and dividing the product by 67.

The cost per ton-mile hauled is determined by dividing the cost per mile of haul by the weight of the load in tons. The average weight of the load of crops hauled with the  $\frac{3}{4}$ -ton trucks as given by the truck owners in 1920 was 1.33 tons, for the 1-ton trucks the average load was 1.31 tons, for the 1 $\frac{1}{2}$ -ton trucks 1.74 tons, and for the 2-ton trucks 2.2 tons. The cost per mile of haul for the trucks of different sizes

divided by these figures gives the cost per ton-mile. Figure 8 shows the proportion of the total cost of hauling with trucks of different sizes chargeable to the driver and the proportion chargeable to the truck.

### RELIABILITY.

The reliability of a motor truck, as that of any other machine, has a very decided effect upon its profitableness. If a truck is out of commission for several days at a time when its services are needed and when its owner is depending upon it to help him through a busy time, it can scarcely be considered a profitable machine for him to own.

In order to afford prospective purchasers information as to the reliability of motor trucks for farm use, these truck owners were asked both in 1920 and in 1922 to give the number of days their trucks had been out of commission when needed during the preceding year.

In 1922, 492 of the 508 men who were still using their original trucks gave the number of days they had been out of running order

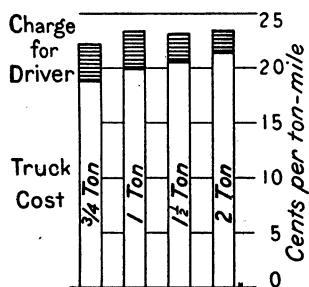


FIG. 8.—Cost per ton-mile of hauling crops with trucks of different sizes.

when needed in 1921. Three hundred and seventy-four of the trucks, about three-fourths of the entire number, had always been ready for work when needed, 79 had been out of order for 5 days or less, and the remaining 39 for 6 days or more. None of these trucks had been in use less than two years at the time the reports were made. Four hundred and seventy-five of the same men had given in their previous reports the number of days their trucks were out of order during 1919. Evidently there is a somewhat greater likelihood of a truck getting out of running order as it becomes older, as the earlier reports

show that 415, or about 87 per cent, of the machines had always been ready for work when needed during the year covered by the earlier reports.

To a certain extent the reliability of a motor truck, as of any other complicated machine, depends upon the ability of the operator and the care which the machine is given. Most of these trucks are operated by their owners, or some member of the family, and it is to be expected that the owner of such an expensive machine as a motor truck, or any member of his family, would give it a reasonable amount of care, and at least endeavor to operate it intelligently. Furthermore, automobiles are owned on a large majority of these farms, and tractors on 55 per cent of them. Thus nearly all the men who drive the trucks have doubtless had considerable experience in the operation of similar machines. The exceptionally small amount of trouble which these trucks have given is doubtless due in part to these facts.

### SAVING OF HIRED HELP.

The saving of time is given by these men as the greatest advantage in the use of a motor truck; but the saving of time will not be of any financial benefit to a farmer unless he uses the time thus saved

on other work, or unless it enables him to reduce the expense for hired help. In the 1920 investigation, each truck owner was asked whether or not his truck reduced the expense for hired help, either man or horse, and if so, to estimate the amount thus saved during the preceding year. The replies, as summarized in Department Bulletin 931, show that of 783 men who answered the question, 612, or 78 per cent, said that the truck reduced this expense, and the remaining 171 that it did not.

Three hundred and eighty-five of the 612 estimated the amount thus saved, and the average of these estimates was \$209. The wages of farm laborers were considerably higher at that time than at present (June, 1922), and on the basis of 1922 wages this average saving would be between \$100 and \$150. This figure can scarcely be taken to represent the actual amount which the labor bills of these men have been reduced since purchasing their trucks, but rather as their estimates of the amounts by which their bills would be increased if they did not now own trucks and if they were doing the same amount of work they are now doing.

There was little difference in the percentage of the owners of trucks of different sizes who said that their trucks reduced the expense for hired help, or in the amounts which they estimated the trucks saved.

### DISPLACEMENT OF HORSES.

If the organization of a farm is such that some work stock must be kept primarily for hauling on the road, the purchase of a truck should enable the farmer to dispose of such work stock and reduce his expenses correspondingly. On most Corn Belt farms, however, the work stock which it is necessary to keep in order to carry on the field work satisfactorily can also do all of the hauling on the road.

The truck owners were asked in 1920 to report the number of work stock they were keeping at that time and the number they had disposed of since purchasing their trucks. They were also asked in 1922 for the number of work stock kept, and 382 of the 508 owners gave complete reports on their work stock in both years. In 1920, 160, or about 42 per cent, stated that they had reduced their work stock by an average of  $2\frac{1}{2}$  head after purchasing their trucks, and the remaining 222, about 58 per cent, stated that they were keeping the same number as before. There had been practically no further reduction between 1920 and 1922, as the 382 men were keeping an average of 8.3 head in 1920 and 8.1 head in 1922.

### FARMS ON WHICH BOTH TRUCKS AND TRACTORS ARE OWNED.

In 1922 tractors as well as motor trucks were in use on 55 per cent of the farms from which reports were received. In 1920 tractors were in use on 50 per cent of these same farms. Most of the tractors were owned on the larger farms. There was an average of 258 crop-acres on the farms where tractors were in use in 1922, and 214 crop-acres on those farms where tractors were not in use. The men who owned tractors as well as motor trucks kept an average of 8 head of work stock on each farm, one for every 32 crop-acres, while the men who did not own tractors kept an average of 8.2 head, one for each 26 crop-acres.

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<i>Division of Agricultural Engineering</i> ..	S. H. MCCRORY, <i>Chief</i> .

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